

LOUISVILLE AND PORTLAND CANAL.

LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

*Report of the Louisville and Portland Canal, with estimate of the cost of repairing the same, &c.*

JANUARY 12, 1857.

Referred to the Committee on Commerce, and ordered to be printed.

TREASURY DEPARTMENT, *January 9, 1857.*

SIR: Enclosed is the report of Edward Watts, esq., the engineer in the employ of the Louisville and Portland canal, in deepening and widening the canal, &c.; also his report of a survey of a branch of the present canal, with an estimate of the cost of the branch, and a set of locks sufficient for the largest class of boats; and also an estimate of the cost of repairing and improving the present canal so as to accommodate the commerce of the river. I also enclose the report of the president, James Marshall, esq., of the expenditures for the repairs.

Mr. Watts has with him the plans, which I have requested him to submit and explain to the Committee of Commerce on the House of Representatives.

I am, very respectfully,

JAMES GUTHRIE,  
*Secretary of the Treasury.*

Hon. N. P. BANKS, JR.,  
*Speaker of the House of Representatives.*

*Report of the Board of Directors of the Louisville and Portland Canal Company, showing the expenditures for repairs, improvements, &c., during the months of August, September, and October, 1856, while the canal was closed.*

Amount paid P. & M. Pfeiffer for rebuilding lock-wall...	\$13,878 00
Amount paid contractors for removing ledge on north side of canal .....	21,627 15
Amount paid for removing mud and stone from bottom, and repairing slopes .....	26,378 71

## LOUISVILLE AND PORTLAND CANAL.

Amount paid for removing ledge from south side, and re- building vertical walls.....	\$8,409 54
Amount paid for removing mud and stone from basin No. 2	4,332 67
Amount paid for removing mud and stone from basin No. 3	4,226 95
Amount paid for labor and hollow quoins for guard-gate, head of canal.....	1,585 24
Amount paid for removing stone arch bridge.....	636 16
Amount paid for powder for blasting in basins Nos. 2 and 3	1,300 00
Amount paid for carpenters' work in repairing gates, making cranes, railroads, &c., and work on mud-boat..	1,041 49
Amount paid for castings for mud-boats and locks.....	1,091 42
Amount paid for sheet-iron work for mud-boats.....	142 77
Amount paid for lumber and brick work for mud-boats...	338 65
Amount paid engineers, per order of Colonel S. H. Long.	303 37
Amount paid for iron, wheelbarrows, shovels, picks, drills, sledges, cranes, blocks, lines, lumber, blacksmithing, salaries, office expenses, &c.....	6,295 22
Total expenditures.....	<u>91,587 34</u>

Respectfully submitted.

JAMES MARSHALL, *President.*

LOUISVILLE, *December 13, 1856.*

OFFICE LOUISVILLE AND PORTLAND CANAL,  
*Louisville, December 13, 1856.*

SIR: This will be handed you by Edward Watts, esq., whom I beg leave to introduce to your acquaintance.

Since the first day of August, when the canal was closed, Mr. Watts has been busily engaged in superintending its repair and improvement, and in making a survey of a branch canal. I forward to you by him his report to the board on the location surveyed for the branch canal, with his estimates of the cost of the same; also the report of the board, showing the expenditures for repairs, improvements, &c., during the months of August, September, and October, while the canal was closed.

I am, with much respect, your obedient servant,

JAMES MARSHALL,  
*President.*

HON. JAMES GUTHRIE,  
*Secretary of the Treasury, Washington, D. C.*

## REPORT OF EDWARD WATTS, CIVIL ENGINEER LOUISVILLE AND PORTLAND CANAL, KENTUCKY, DECEMBER 12, 1856.

LOUISVILLE, *December 12, 1856.**To the President and Directors of the Louisville and Portland Canal Company:*

GENTLEMEN: In accordance with your instructions, I have the honor to present the following report, with the accompanying maps, showing the location of the Louisville and Portland canal, at the falls of the Ohio river, with the enlargement and extension as proposed, so as to "avoid the rocks at Sandy island," and the deposits of sand and sediment, which accumulate and impede the navigation at the outlet locks, thereby causing great delay and expense to remove the same after every rise of the river.

Also, the location and plan of the new lock, showing its dimensions and advantages of its position, enabling boats of the largest class freely to enter or pass out of its chamber without the aid of stern cables, or encountering any such difficulties as those presented at the old locks, or as would certainly attend any location on the Kentucky shore, differing from the one designated on the map, with a plan of a lattice pivot bridge, two of which it will be necessary to construct to accommodate the trade and travel of Shippensport—one about midway of the canal; the other near the dry dock, at the intersection of the branch, or new work, with the old canal.

Also, two basins, or passing places for boats—one above, and the other below the place marked by the abutments of the old stone arch bridge—each four hundred and fifty feet long, one hundred feet wide, and six feet deep at ordinary low water.

Also a set of guard-gates, near the head of the canal, opposite 10th street, with a sufficient number of valves inserted to admit the water freely into the canal. By means of these gates the water can be readily drawn off from the canal when repairs are necessary. They will also, by being raised sufficiently high, serve to prevent drift and other deposits from collecting in the canal during high water. A bank connecting the abutment walls of the guard-gate with the high ground on the land side of the canal is necessary, to exclude the river altogether from entering the canal at its head.

A floating boom, properly constructed, above the guard-gates, would answer a good purpose in preventing ice and drift from entering the canal.

A channel one hundred and thirty feet wide will be excavated from the tail of the lift-lock to the deep water in the river.

Below the lower hollow quoins of the lift-lock there will be a groove or recess cut in the side walls for stop plank, three inches wide, and three inches deep, as marked on the plan, which will be used, if it becomes necessary, to throw out all the water from the lock chamber.

The canal to be one hundred feet wide at bottom, having vertical side walls seventeen feet high, at the level of the top of the vertical side walls to be an offset or berm twelve feet wide. Above this level,

for fourteen feet in height, the inside of the banks of the canal to have a slope of one and a half foot base to one foot rise, and be protected from washing by means of a stone pavement; above this to be another offset or berm twelve feet wide, and thence up to the top of the banks, say for fifteen or twenty feet in height, to have an inner slope of one and a half foot base to one foot rise. The width of the banks at the top, where they rise above the level of the ground adjacent, to be as wide as a regular distribution of the earth excavation will make them, and be three feet higher than the highest stage of water known to have occurred in the river.

The depth of the canal to be such that boats of a maximum draught of eleven feet may, at the lowest stage of the river in which that depth available for navigation is to be had on the bars in the river, pass over the mitre sills of its guard-gates with one foot of water to spare.

The bottom of the canal should have a descent from its guard-gates to the lift-lock at the rate of one foot per mile, for the purpose of causing a strong current when the guard-gates are closed; the level of the water in the canal reduced, and the valves in the guard-gates and the culverts in the side-walls of the lock are opened, with a view of washing out the sediment brought into the canal when in use.

The depth of water on the lower mitre sill of the lock to be six feet below the surface of ordinary low water.

The embankments of the canal at the lock must be of the same height as at the guard-gate, which will be three feet above high-water mark, and extend throughout the entire improvement, in order to prevent freshets from breaking over the banks of the canal and leaving such heavy deposits of mud and drift as frequently occur to the great prejudice of the navigation.

The external walling that will be required to protect the left lock from floating ice or drift shall be carried up from an approved foundation.

The foundation of every slope wall shall be at right-angles with the slope of the embankment it is designed to protect, and the successive beds formed in carrying it up shall be parallel to its foundation. No wall shall be constructed against any embankment which has not had sufficient time to settle before it is made to press upon it. In this case, where the outside wall at the lock is liable to be covered by river freshets, the embankment behind the same shall be carried up with the spalls of the quarries or excavated rock from the canal one foot in thickness. Where vertical walling is required, it must be coped with the best of stone. The lift-lock will have a solid rock foundation, and be constructed of stone of the most enduring quality, eighty feet wide, having two sets of lower gates, instead of one, as in ordinary cases, and so placed, respectively, that the chamber of the lock may be 265 feet or 400 feet long, as will best suit the lengths of the boats passing through.

The lock to be filled by means of culverts—one in each side wall—and be emptied through a corresponding number of culverts or openings in the manner described on the plan.

The recesses for the gates shall be one foot ten inches deep and forty-six feet long.

The highest stage of water in which the canal may be used is

assumed at ten feet above ordinary low water at the head of the falls. At that stage the descent in the river from the head to the foot of the falls does not exceed three and a half to four and a half feet.

The side walls of the lock should be raised to a level six feet higher than the height above assumed, as the highest in which the canal will be used. The lower lock gates to be raised only to the level of the highest stage of navigation in the canal. The upper gates are to be raised to within one foot of the level of the lock coping.

These main walls shall be twenty feet thick at bottom, and be diminished in width by battering one and a half inch to the foot on their back, as designated on the cross section accompanying plan.

The upper and lower wings shall extend at right angles to the line of the lock, twenty-five feet from the face of the main walls, and be connected with the same by curves described with a radius of ten feet.

The face stone shall be sound and compact, and of a quality to endure the frost and sun; they shall be laid upon their natural beds, and fitted to their places before they are brought on the wall; and in order that the stones may be properly laid, cranes shall be used in handling them upon the wall, and in laying them; and when laid, great care must be taken not to move them or break their beds.

All the face stones shall be hammer-dressed on their face, in their beds, and in their joints, so that by taking off the hammered surfaces one-half inch, a perfect and complete cut stone in every respect might be had. In other words, the beds, the joints, and the face shall fill the square, and shall be as complete as the beds, joints, and face of cut stone in every respect, except the surfaces being hammered instead of cut.

There shall, on an average, be a header or bond stone for every ten feet in length on each course, measured from centre to centre of the headers.

And in laying the work these headers shall be placed as near to this average as the intermediate stretchers will allow. The headers of any course shall divide as nearly as practicable the spaces between the headers below.

No course shall be less than sixteen inches in thickness, and no stretcher shall have less than twenty-four-inch bed; and when the thickness of the course is greater than twenty-four inches, then the stretchers shall have as much bed as face.

No smaller course shall precede a larger; the thicker courses shall be laid at the bottom, and decreasing, if the courses are very various, regularly as practicable in rising to the coping, and each course shall retain a uniform thickness around the entire lock.

The stretchers shall not be less than six feet long, and their ends shall make an even and full joint of not less than nine inches in from the face of the wall.

The headers shall be in width on the face not less than the height of the course. All the headers shall extend into the wall not less than four feet six inches.

The face stones, whether headers or stretchers, shall have parallel beds throughout, and they shall be so hammered as to lie as firm upon each other throughout their whole width as they do in front. All the face stone shall be laid in full beds of mortar. Every stone must be



completely prepared before it is laid, so that no trimming will afterwards be necessary. Each course shall be laid entirely around the lock before a stone shall be laid in the course above. The pointing shall follow on immediately after the laying, but so that it shall always be one course below it.

The backing shall be composed of good, large, solid, sound, and well-shaped building stones—none of which shall be less than two cubic feet, except when necessary to fill interstices, and to level up the work. Great care shall be observed to bind the back of the masonry well with the headers of the face stones.

All the stones from the back of the lock eighteen inches into the wall, and spaces two feet wide at every ten feet along the wall, from the back to the face, shall be well laid in full beds of mortar; and all the interstices in the wall, not occupied by stone or mortar, shall be completely filled with grout.

The laying of the backing shall follow on directly after the laying of the face stones, and it shall be well grouted at each course in height, and in no case shall any face stone be laid while any of the course below it within fifty feet has not been fully and thoroughly grouted.

The breast wall shall be built of masonry similar to that prescribed for the lock walls, and be coped with stone six feet wide and twenty inches thick. The top of it will be eighteen inches below the bottom of the upper level.

The hollow quoins shall be formed of stone closely cut throughout their face, their beds, and their joints. What is usually called a whole hollow shall be a header, and the half hollow the stretcher, so that they shall be alternately headers and stretchers. The straight part of the whole hollow in the recess shall not be less than the height of the course, neither shall the straight part in the chamber be less; and the half hollow shall break over the whole hollow at least equal to its own thickness. The half hollow shall be in width such that in no place, measuring it at right-angles to its own face, whether in the curve or in the straight part of it, shall it be less than eighteen inches; neither shall the joints be less; and the hollow, when laid in its place, shall not be less than forty inches, measuring it from any part of the face at right-angles to the lock.

The mitre sills will be composed of stone twenty inches deep, well jointed, and put together in a workman-like manner, as drawn on the plan; they will be laid in cement, on a foundation properly prepared, and secured in their places by inch-and-a-quarter bolts three feet long, and split at the points to receive a wedge. The lock-gates will be built in accordance with the plan.

The main walls and wings of the lock shall be coped with stone at least six feet long, four and a half wide, and twenty inches deep. It shall be so laid as to present a uniform width on top. The angle formed by the intersection of the top of the coping and the face of the main walls and wings shall be rounded off to a radius of three inches. The end joints shall be hammer-dressed full and even throughout the entire length of the coping, and the top and beds shall be hammer-dressed and parallel, so as to give a firm and solid bearing throughout. The face shall be neatly hammer-dressed, and the back of the

coping hammered off regularly. The coping around the gates, and from the upper gates to the head of the lock, and from the lower gates to the end of the lock, shall be connected by iron clamps and bolts. The culverts to admit the water into the chamber of the lock, and to discharge the same, will be six feet high, three feet wide, and have such position in the lock-walls as is defined on the plan.

The cement must be tried and approved of before using it. The sand must be clean and sharp, and if deemed necessary, it must be washed.

The cement will be mixed with the sand in the proportion of one and a half measures of cement to one of sand.

The mortar shall be well worked upon an approved bed formed of plank, and the length of time between the first wetting of the cement and its being placed in the wall shall not exceed one half hour.

The grout shall be formed of cement and sand, mixed in the same proportions as the mortar, and no longer time shall elapse between the wetting of the cement and its use than in the case of the mortar—viz: one half hour.

Interior dry walls will be built at each end of the lock, to prevent the earth from sliding into the canal. There will also be an outside slope wall constructed at the side of the lock next the river, to prevent ice and drift from abrading the embankment.

Below the lift-lock a channel one hundred and twenty feet wide is to be made through "the rocks" to the deep water below, in the direction of the lock, and to the depth of the top surface of its lower mitre sill.

The enlarged and extended canal will be about two and a quarter miles in length—a little more than a quarter of a mile longer than the present improvement.

All the widening will be on the south side of the old canal. The excavation will be somewhat less in quantity than on the north side. The guard-bank between the canal and the river is now completely settled, and consequently not so liable to be injured by freshets.

The east excavation from the opposite side would be very useful in widening and raising the guard-bank to the proposed height, thereby greatly strengthening it against high-water abrasions.

The small extent of widening on the north side, near the head of the canal, and also opposite basin No. 2, which would be necessary to straighten the line, suits well at those places, as the earth could be advantageously used in filling up adjacent low grounds.

The materials excavated from the extension would be placed chiefly in its lateral banks, and in widening and raising to the required height the south bank of the enlarged portion of the canal.

Near the head of the canal, on the south side, a cesspool should be made, outside of the water way, for the reception of the wash brought down by two or three of the streets of Louisville that terminate in that neighborhood.

No provision is made in the estimate of the cost of the large and extended canal for any expenditure on the present improvement below the point where the two diverge, believing it better that it be left until future developments show whether any real advantage would attend, for many years at least, any considerable expenditure upon it

for repairs and improvements beyond what is required to maintain it in its present navigable condition, and for which the revenues of the canal are amply sufficient. The portion of the present canal referred to might be left in its present condition without any injurious consequences resulting to the enlarged and extended canal.

The question of the immediate radical improvement and enlargement of the canal at this point derives additional importance from the fact, that of late years long periods of low water in the Ohio river have become more frequent, and, in consequence of the general increase of tonnage, more disastrous to the vast commercial business of the interior.

The cities along the Ohio and Mississippi rivers, so largely dependant upon a good navigation for their continued prosperity, are alive to the importance of an improvement, not only in the means of passing this great obstacle, the falls at Louisville, but in the Ohio river generally, as well as the improvement of the rapids in the Mississippi.

During the season of 1856, just passed, the navigation for many successive months was literally destroyed, owing to the insufficient depth of water left in the channels. Whilst this long period of low water afforded an excellent opportunity for completing valuable improvements in the canal at Louisville, it has served to enforce the absolute necessity of the earliest attention to the permanent and general improvement of the river navigation.

Several plans have been at various times suggested: clearing out channels, and erecting dams for confining the water, thus increasing the depth, which was partly executed with varying results some years since by the general government. A regular system of locks and dams between Pittsburg and Louisville, or Cairo, have been strongly urged by many practical persons. It has also been proposed to establish a constant sufficient flow the year round by means of artificial reservoirs, to be constructed on the headwaters of the river; and it has been suggested that a system of dams left open at one end, with a mound or embankment extending upward through each pool, forming a gradual descent for the water, (without locks,) would answer a good purpose. Whether any one, or any combination of these, or some other plan, may be finally adopted or not, one thing is quite certain, viz: that the magnitude and monetary value of the interests concerned are such as to demand from the general government, in view of its own great interests, the most favorable consideration.

It can no longer be disguised that the precarious nature of the navigation of the Ohio is affixing, prematurely, limits to its trade, and consequently to the general business of the country, and to the trade and travel passing through the Louisville and Portland canal; and when it is considered that there are already more than a thousand steamers navigating the Ohio and its connecting waters, the importance of some immediate and adequate remedy of a truly national evil can scarcely be overrated.

The present canal around the falls of the Ohio, between Louisville and Portland, at one time fully adequate to all the purposes required, is by no means now commensurate with the enormous transportation and increased size of the steamboats employed.

My predecessors, in recommending their important improvement to



the attention of government, might very properly have stimulated their patrons with such hopes as inspired the old alchemists in their efforts at transmutation. Though they did not attain the veritable object of their research, they, nevertheless, did much to enrich the world by minuter discoveries in science, and led the way to the accumulation of wealth and knowledge through channels not contemplated in their process.

Thus the investigations of the able engineers hitherto engaged in this work have opened the way to further improvements.

The plan I have suggested differs from the plan of the canal now in use in many respects, and promises an ampler revenue when in complete operation.

A canal of such size and construction as shall allow the largest class of steamboats and freight of all kinds, without transshipment, to pass around the falls, at low stages of the river, is imperatively demanded. Hundreds of thousands of dollars would be yearly realized by the general government in the event of an appropriation for that purpose. This is abundantly proved by the receipts of the company even under present disadvantages.

Through this mid-gate of our extended country, even with its comparatively limited capacity, not less than two hundred thousand persons pass annually.

But when the yet unexplored west shall be ready to pour its treasures through this channel, and expect in return the product of our Atlantic region—when we shall not compute our trading and travelling population by thousands but by millions, shall we, like the people of old on the shores of Jordan, be content to rear a fabric of loose stones to commemorate the passage of a multitude incomparably greater?

Let us rather immortalize this era by a structure of such proportions and usefulness as may compare, in some degree at least, with what nature has done in our wonderful country.

May not this republic, like Greece, produce an enduring monument of art, not merely like the colossus of Rhodes, to insure itself a place among the wonders of the world, but be the means of attaining such results as can only be estimated as time shall develop the forthcoming achievements of our enterprising people?

It is estimated that the probable cost of the enlargement and extension of the present canal would be as follows, viz:

*Division 1.*—Excavation in the widening and extension of the old canal from its head to its intersection with the proposed branch canal near the dry dock, including the foundations for bridges, guard-gates, vertical walls, also slope walls along the sides of the canal, and two basins for boats, &c.

373,480 cubic yards earth excavation, at 35 cents.....	\$130,718
124,492 cubic yards rock excavation, at \$1 25 .....	155,616
33,506 cubic yards vertical wall, at \$2 .....	67,012
28,160 cubic yards slope wall, at \$2.....	56,320
2 lattice pivot bridges, and guard-gate .....	52,000
Floating boom to glance off drift wood and ice at the head of the canal.....	8,000

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469,666

*Division 2.*—The extension or branch canal embraces the dry dock, and terminates “below the rocks” at Sandy island, including the lift-lock, protection walls, lock-house, and all the gates, mitre sills, culverts, and fixtures pertaining. The masonry to be of stone, the excavation of which is paid for under the item of rock excavation in the canal, excepting the hollow quoins, coping, and face work of culverts.

411,400 cubic yards earth excavation, at 35 cents.....	\$143,990
137,132 cubic yards rock excavation, at \$1 25 .....	171,415
38,150 cubic yards masonry in lift-lock and the extension walls above and below the lock laid in cement mortar..	305,200
15,250 cubic yards vertical wall, at \$2 .....	30,500
13,600 cubic yards slope wall, at \$2 .....	27,200
3 sets of lock gates, mitre sills, &c.....	45,000
House for lock-keeper and assistants .....	3,000
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	726,305
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*Recapitulation.*

1st division will cost when completed.....	\$469,666
2d division will cost when completed.....	726,305
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	1,195,971
Add 10 per cent. for contingencies that may be occasioned by high water .....	119,597
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	1,315,568
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Respectfully submitted.

EDWARD WATTS,  
*Civil Engineer.*

Hon. JAMES GUTHRIE,  
*Secretary of the Treasury.*